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IN THE U.S. PATENT AND TRADEMARK OFFICE

Inventor	Gerhard SCHMITT	
Patent App.	09/601,377	
Filed	27 July 2000	Conf. No. 2311
For	REACTOR FOR GASIFYING GRANULAR FUELS WHICH FORM A FIXED BED	
Art Unit	1764	Examiner Duong, T

Hon. Commissioner of Patents
Box 1451
Alexandria, VA 22313-1451

Appealed 10-Jan-05

APPEAL BRIEF UNDER 37 CFR 1.192(a)

Now comes appellant by his duly authorized attorney and submits his brief under the provisions of 37 CFR 1.192(a).

(1) REAL PARTY IN INTEREST

The real party in interest is Metallgesellschaft Aktiengesellschaft, a joint stock company of Germany, having a principal place of business at Bockenheimer Landstrasse 73-77, D-60325, Frankfurt/Main, Germany.

(2) RELATED APPEAL AND INTERFERENCES

There are no related appeals or interferences.

(3) STATUS OF CLAIMS

Claims 1 through 6 and 12 have been canceled. Claims 7 through 11 are pending and are the subject of this appeal.

(4) STATUS OF AMENDMENTS

Appellant filed an Amendment Under 37 CFR 1.116 After Final Rejection on 3 December 2004. In the Advisory Action mailed 28 December 2004 the Examiner indicated that he had considered the amendment, but that the application was still not in condition for allowance.

(5) SUMMARY OF THE INVENTION

Appellant has discovered a reactor for gasifying granular fuels, which comprises:

a casing;

a reservoir for holding the granular fuel and communicating with the inside of the casing;

structure in said casing for defining a fixed bed of the granular fuel at a lower portion of which, an oxygen-containing gasification medium is introduced, said gasification medium moving up through said fixed bed of granular fuel;

a gas inlet for said gasification medium below said bed and admitting said gasification medium to said fuel for an endothermic reaction thereof with partial oxidation;

a discharge duct located above the fixed bed of granular fuel through which product gas containing hydrogen and carbon oxides is withdrawn from the reactor; and

at least one centrifugal separator in said casing and at least partially surrounded in said bed for separating solids from the product gas, having an inlet opening for dust-laden product gas coming from the fixed bed of granular fuel, an outlet line for product gas, and a solid discharge line leading into the fixed bed, said outlet line from the centrifugal separator communicating with the discharge duct.

The principal salient feature of the present invention is that within the reactor casing there is included at least one centrifugal separator, used for separating out solids from the product gas, where the centrifugal separator is at least partially surrounded in a fixed bed of the granular fuel. This feature is shown in each of Figures 1,2 and 3 showing the fixed bed of granular fuel (4) in which the cyclone separator (13) is at least partially surrounded. None of the prior art references taken individually or in combination shows or suggests such a structure.

(6) THE ISSUE

The issue is whether the presently claimed reactor for gasifying granular fuels having a casing which contains a fixed bed of granular fuel at least partially surrounding a centrifugal separator would be obvious under 35 USC 103 in view of the cited combination of the prior art references, namely, MAYERS, PRIESTLEY and ANGELL.

(7) GROUPING OF CLAIMS

Claims 7, 8 and 11 will stand or fall together since the invention is the reactor for gasifying granular fuels of a structure in which the reactor casing contains a fixed bed of granular fuel at least partially surrounding a centrifugal separator. However, claims 9 and 10 are believed to be directed to specific embodiments for which there are additional bases for patentability. The reactor for gasifying a granular fuel defined in claim 9 requires that a vertical annular wall be located in the upper portion of the reactor and that the inlet portion of the centrifugal separator be located outside the potion of the reactor encompassed by the annular wall. See Fig. 2. The reactor for gasifying a granular fuel as defined in claim 10 also requires that a vertical annular wall be located in the upper portion of the reactor, but this time the entire centrifugal separator is located outside the portion of the reactor

encompassed by the annular wall. See Fig. 1. These specific structural features for the reactors of claims 9 and 10 together with the requirement that the centrifugal separators be at least partially surrounded by the fixed bed of granular fuel are especially structurally far removed from the cited prior art and therefore claims 9 and 10 are especially believed to be patentable.

(8) THE ARGUMENT

None of the three prior art references cited by the Examiner, individually or in combination, provides any basis to reject any claim on appeal as obvious under 35 USC 103. PRIESTLEY discloses a reactor and a process that are entirely different from those of the presently claimed invention. PRIESTLEY discloses a fluidized bed (see elements 53 and 54 inside the reactor 10). The purpose of the PRIESTLEY process is to destroy organic waste materials, for example sewage sludge (col. 2, line 67), by burning the organics essentially completely (complete combustion and destruction of odorous constituents is mentioned in col. 4, lines 5 and 6 of the reference) with fuel (31) wherein a substantial amount of bed fines (sand particles, col. 3, lines 36 and 37) and ash are elutriated (39, 41) with the exhaust gases. The solids are separated from the exhaust gases and returned directly to the fluidized bed (43,44).

PRIESTLEY does not describe the composition of his exhaust gases, but it is well known that the main components of exhaust gases from burning organics are HCl, (NO)x, SO2, CO, HF, PCDD, and PCDF.

The presently claimed reactor in new claims 7 through 11 relates to a fixed bed reactor for gasifying granular fuels (granular fuels include all kinds of coal according to page 1, paragraph 3, In the lower portion of the fixed bed formed by the granular fuels, an oxygen-containing gasification medium is introduced into the reactor and a product gas containing hydrogen and carbon oxides is produced. The product gas contains dust-like ash particles which are separated by at least one centrifugal separator. The remaining ash is withdrawn downwards through an opening (7) at the bottom of the reactor.

PRIESTLEY discloses a fluidized bed reactor for burning organic waste material requiring addition of a fuel furnished to the fluidized bed by fuel guns (31) penetrating the vessel wall. The exhaust gas contains the abovementioned components as products of combustion such as sulfur dioxide and nitrogen oxides whereas the presently claimed reactor is not used for a combustion process to produce an exhaust gas, but through an endothermic reaction produces a synthesis gas containing carbon monoxide and hydrogen which is itself highly combustible.

Another difference between the PRIESTLEY reactor and the presently claimed reactor is that the centrifugal separators 39 and

41 of PRIESTLEY are located entirely above and outside of the fluidized bed whereas Appellant's cyclone separators are at least partially surrounded in the fluidized bed. See claim 7 and Figures 1 through 3.

Thus the PRIESTLEY reactor differs from the presently claimed reactor in terms of structure as PRIESTLEY discloses a fluidized bed reactor with centrifugal separators outside the bed and the present invention in claims 7 through 11 is directed to a fixed bed reactor with centrifugal separators at least partially surrounded by the fluidized bed. Furthermore the PRIESTLEY reactor is operated to carry out combustion of organic waste material whereas the present invention includes operating the fixed bed reactor of claims 7 through 11 to produce a synthesis gas. In view of the above the PRIESTLEY reference provides no basis to reject any claim on appeal as obvious under 35 USC 103.

The Examiner has rejected all claims on appeal as obvious under 35 USC 103 in view of MAYERS (B). Appellant believes that no such rejection should be maintained against any claim now presented. MAYERS discloses a reactor for completely burning granular fuels in a fluidized bed of finely divided solid material for producing a hot high pressure gas stream suitable for use as the work medium for a gas turbine. See col. 1, lines 15 to 20. Initially the material making up the bed may be ash from the fuel to be burned or a relatively inert material such as alumina or silica. The inert material is of a particle size to permit fluidization of the bed

under the influence of an upwardly rising gas stream; see col. 1, line 68 to col. 2, line 12 of the reference. Finely divided carbonaceous fuel is introduced below the upper surface of the bed. The intense agitation of the particles forming the fluidized bed effects complete mixing of fuel and inert material, and the fuel is dispersed substantially uniformly throughout the bed and combusted. See col. 2, lines 27 to 41. The compressed fluidizing air stream flows upwardly into the combustor and through the bed; see col. 2, lines 19 through 22. Since combustion occurs in the bed containing a major portion of inert particles, the bed provides an effective ash filter, and the hot gas collecting near the discharge of the combustor contains substantially less entrained ash than gas produced by direct burning of pulverized fuel in a high velocity air stream. See col. 2, line 72 to col. 3, line 5 of the reference. The hot gases rising from the fluidized bed will entrain some dust, which may be separated by means of one or more cyclone separators positioned in the upper portion of the combustor. By the combustion of the solid fuel in the fluidized bed, the temperature of the air is raised. The heated gases consist of a major portion of air and a minor portion of combustion gas. See col. 5, lines 10 to 14 of MAYERS.

The presently claimed reactor is employed to gasify granular fuels forming a fixed bed in which a mixture of oxygen and steam is introduced to effect a partial oxidation as required in endothermal gasification reactions for the production of hydrogen

and carbon oxides, well known as syn gas. In accordance with MAYERS the product gas will be purified to remove entrained dust by means of one or more cyclone separators positioned in the upper portion of the gasifying reactor.

The reactor in MAYERS, like the reactor in PRIESTLEY, is a fluidized bed reactor as opposed to Appellant's fixed bed reactor. Furthermore the cyclone separators (16) in the MAYERS reactor are located entirely above the fluidized bed (11) and are not at least partially surrounded by the fixed bed as in the presently claimed invention. Thus the MAYERS reactor differs structurally from the presently claimed reactor for the same reasons that the PRIESTLEY reactor differs from the present reactor. It is also clear from col. 4, lines 59 and 60 of MAYERS that the process disclosed therein is not a partial oxidation to produce synthesis gas. Instead the MAYERS process employs air in an amount in excess of that required to combust all of the solid carbonaceous fuel in the fluidized bed.

In view of the above, the MAYERS reference provides no basis to reject any claim on appeal as obvious under 35 USC 103.

Lastly the Examiner has rejected all claims on appeal as obvious under 35 USC 103 citing the combination of MAYERS and ANGELL. The Examiner has applied ANGELL because this reference discloses a reactor containing both an annular chamber (4) and cyclone separators (22) which are disposed outside the portion of the annular chamber. The cyclone separators contain inlet lines (23) that communicate with the catalyst bed and outlet lines (24)

that lead to an outlet compartment or header circumventing the top of the annular chamber through which the product is removed from the reactor through a line (26). The Examiner considers this structure to be analogous with that of the present invention as shown in Appellant's Figures 1 and 2 and as claimed in claims 9 and 10. However, as in the case with PRIESTLEY and MAYERS, the cyclone separators (22) in ANGELL are located entirely outside of the catalyst bed. See the figure of ANGELL where the separators are located completely above the lower catalyst bed (7) in the reaction zone (5) and entirely below the upper catalyst bed (11) in the regenerating zone (6). Once again the presently claimed invention requires that the cyclone separators be at least partially surrounded by the fixed bed of granular fuel. Furthermore according to col. 2, line 9 of ANGELL the lower catalyst bed in the reaction zone is maintained in a fluid-like condition unlike the fixed bed of granular fuel of the presently claimed invention. Thus the structure of the ANGELL reactor is not at all like the structure of the reactor in the presently claimed invention.

In view of the above it is believed that no claim on appeal should be rejected as obvious under 35 USC 103 in view of PRIESTLEY, MAYERS and ANGELL, individually or in combination.

In the advisory action mailed 28 December 2004 the Examiner refers to the MAYERS (B) reference and indicates that in Fig. 1 of that reference the combustor 12 contains a fluidized bed 11 of divided solid material that at least partially surrounds the

cyclone separators 16 notwithstanding that the surface of the finely divided solid material is clearly below the cyclone separators. The Examiner argues that the less dense top part of the fluidized bed extends above the surface as shown and at least partially surrounds the cyclone separators.

The Examiner admits that MAYERS discloses a fluidized bed reactor and Appellant discloses and claims a reactor for gasifying granular fuels which includes a fixed bed reactor. However, the Examiner seems to believe that Appellant's claims are not limited to a fixed bed reactor though he has not indicated why he has this belief. Perhaps the Examiner has noticed that claim 7, line 17 refers to "said bed" rather than to "said fixed bed" and is arguing that the claims are not limited to a fixed bed reactor. If so, the Examiner is entirely incorrect since Appellant states in claim 7, lines 6 and 7, and line 13 that a fixed bed of the granular fuel is present.

Furthermore the fact that there may be a few finely divided particles of the fluidized bed material according to the MAYERS process above the line 11 shown in the figure does not mean that the cyclones are at least partially surrounded by the fluidized bed. There is no indication in MAYERS that the fluidized bed disclosed therein is an expanded fluidized bed. In col. 3 of MAYERS, lines 5 to 10, it is stated that the hot gases rising from the fluidized bed contain dust; no mention is made of particles of a solid carbonaceous fuel. Furthermore Appellant's reactor is a fixed

bed reactor which is not disclosed in MAYERS and MAYERS certainly does not disclose a cyclone separator at least partially surrounded by a fixed bed of granular fuel. Additionally MAYERS discloses in col. 2, line 34 that the material forming the fluidized bed is not predominantly a granular fuel, but is predominantly an inert material. This underscores the principal differences between the present process and that of MAYERS: (1) the present process uses a fixed bed of granular fuel and MAYERS uses a fluidized bed of inert material containing a small amount of the granular fuel and (2) the present process is a gasification process of granular fuel to produce a combustible gas whereas the MAYERS process is a combustion process per se. Furthermore Appellant's claims are clearly limited to a fixed bed reactor and so even if the Examiner were correct that the fluidized bed of MAYERS at least partially surrounds the cyclone separators, the present process is still patentably distinguishable since Appellant alone discloses a fixed bed reactor.

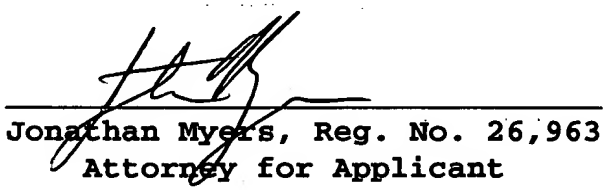
Appellant believes that the reactor in dependent claims 9 and 10 is especially patentable over PRIESTLEY, MAYERS and ANGELL, individually or in combination, because these claims are directed to a gasifying apparatus of a particular structure that not only requires that the centrifugal separators be at least partially surrounded by the fixed bed of granular fuel, but in the case of claim 9 requires that a vertical annular wall be located in the upper portion of the reactor and that the inlet portion of the centrifugal separator be located outside the portion of the reactor

encompassed by the annular wall. In the case of claim 10 the reactor for gasifying a granular fuel also requires that a vertical annular wall be located in the upper portion of the reactor, but this time the entire centrifugal separator is located outside the portion of the reactor encompassed by the annular wall. These additional, specific structural features for the reactors of claims 9 and 10 together with the requirement that the centrifugal separators be at least partially surrounded by the fixed bed of granular fuel are especially structurally far removed from the reactors disclosed in cited prior art and therefore claims 9 and 10 are especially believed to be patentable.

The Examiner has cited U.S. Patent 4,441,892 to SCHUSTER and U.S. Patent 4,146,369 to FLESCH et al, but has not applied either of these references against any claim under 35 USC 103. Neither of these references discloses a reactor for gasifying a granular fuel where within the reactor there is a fixed bed of granular fuel and a centrifugal separator that is at least partially surrounded by the fixed bed of granular fuel.

Appellant respectfully requests that the Board of Appeals and Interferences reverse the Examiner's rejection of all claims as obvious under 35 USC 103 in view of the cited prior art. The cost of filing this appeal brief may be charged to the credit card of the undersigned attorneys. PTO 2038 is enclosed to authorize payment of the fee for filing this appeal brief by credit card.

Respectfully submitted,
The Firm of Karl F. Ross P.C.



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Enclosure: PTO 2038

(9) Appendix The Appealed Claims

Claim 7: A reactor for gasifying granular fuels, which comprises:

a casing;

a reservoir for holding the granular fuel and communicating with the inside of the casing;

structure in said casing for defining a fixed bed of the granular fuel at a lower portion of which, an oxygen-containing gasification medium is introduced, said gasification medium moving up through said fixed bed of granular fuel;

a gas inlet for said gasification medium below said bed and admitting said gasification medium to said fuel for an endothermic reaction thereof with partial oxidation;

a discharge duct located above the fixed bed of granular fuel through which product gas containing hydrogen and carbon oxides is withdrawn from the reactor; and

at least one centrifugal separator in said casing and at least partially surrounded in said bed for separating

solids from the product gas, having an inlet opening for dust-laden product gas coming from the fixed bed of granular fuel, an outlet line for product gas, and a solid discharge line leading into the fixed bed, said outlet line from the centrifugal separator communicating with the discharge duct.

Claim 8: The reactor for gasifying granular fuels defined in claim 7 wherein several centrifugal separators are disposed in the reactor and the outlet lines of the separators open into an annular chamber disposed in the upper portion of the reactor, which annular chamber communicates with the discharge duct.

Claim 9: The reactor for gasifying granular fuels defined in claim 7 wherein in the upper portion of the reactor a vertical annular wall is provided and the inlet opening of the separator is disposed outside the portion of the reactor enclosed by the annular wall.

Claim 10: The reactor for gasifying granular fuels defined in claim 9 wherein the separator is disposed outside the portion enclosed by the annular wall.

Claim 11: The reactor for gasifying granular fuels defined in claim 7 wherein the centrifugal separator is a cyclone.